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		First Named Inventor	Johannes Verboom
		Art Unit	2133
		Examiner Name	Joseph D. Torres
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ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee attached
- ☐ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
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Name (Print/Type)	Craig J. Lervick
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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Johannes Verboom	
Serial No.:	10/014,392	
Filing Date:	October 22, 2001	**Group Art Unit:** 2133
Title:	OPTIMIZED DATA STORAGE SYSTEM AND METHOD FOR OPTICAL STORAGE SYSTEM	**Examiner:** Joseph D. Torres
Docket No:	18504-333	

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Janet Byrne

Janet Byrne

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPELLANT'S REPLY BRIEF TO EXAMINER'S ANSWER

Dear Sir:

In response to the Examiner's Answer mailed on October 18, 2005, Appellant submits the following Reply Brief.

(1) STATUS OF CLAIMS

As indicated in Appellant's original Appeal Brief, claims 1-31 are pending and hereby appealed.

(2) GROUNDS OF REJECTION TO BE REVIEWED UPON APPEAL

Appellant's Statement of Grounds of Rejection to be Reviewed on Appeal is set forth in its original Appeal Brief, and confirmed by the Examiner in the Examiner's Answer. As stated in Appellant's Appeal Brief and for ease of reading and cross-referencing, the Grounds of Rejection to be Reviewed Upon Appeal are:

(a) Claims 1, 3, 10, 13, 14, 16, 17, 19, 20, 22, 23, 26 and 31 were rejected under 35 U.S.C. 102(b) as being anticipated by *Kuroda et al.,* U.S. Patent No. 5,875,163 A. In making this rejection, has the Examiner established a *prima facie* case of anticipation by illustrating the presence of each claim element?

(b) Claims 2, 9, 11, 12, 15 and 27-30 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Kuroda et al.,* U.S. Patent No. 5,875,163 A. In making this rejection, has the Examiner established a *prima facie* case of obviousness?

(c) Claims 4-8, 18, 21, 24 and 25 were rejected under 35 U.S.C. 103(a) as being unpatentable over *Kuroda et al.,* U.S. Patent No. 5,875,163 in view of *Verboom et al.,* U.S. Patent No. 5,574,706. In making this multi-reference rejection, has the Examiner established a *prima facie* case for obviousness?

(3) SUMMARY OF CLAIMED SUBJECT MATTER

In the Examiner's Answer, the Appellant's Summary of Claimed Subject Matter was objected to as being deficient. In response, Appellant's submit the following as a revised and substituted Summary of Claimed Subject Matter.

The present invention provides a data storage system which comprehensively controls data storage and retrieval operations to provide optimized operations while also minimizing a number of error sources. The invention achieves optimized operation by storing information on the media which includes a number of periodically placed reference bytes which are integrated with the data itself. These reference bytes or reference fields are in addition to existing synchronization and timing bytes that are typically included at the beginning of a data sector. Including these periodic reference bytes provides several advantages, such as the ability to continually update and/or adjust its phase control and gain control as needed. Furthermore, the reference bytes easily provide additional error correction information for the data storage system.

Independent claims 1, 13 and 22 each provide a method for operating a data storage system wherein reference fields are first interleaved with data being stored to the media. (See, *Specification*, Figs. 2-5, Ref. Nos. 22 and 18, p. 3, lines 19-24, p. 10, 11, 12-14) The reference field is made up of a predetermined pattern. (See, *Specification*, p. 10, 11, 15-16) These interleaved reference fields are positioned within the data, so that further analysis and examination of the data signal can be accomplished. (See, e.g., *Specification*, p. 13, lines 26-28, p. 15, lines 2-4, p. 16, lines 25-p. 17, line 1, p. 18, lines 6-10) (Claims 1 and 13 specifically state that these reference fields are placed at predetermined locations (See, *Specification* p. 11, lines 15-16)). This interleaved data set is then stored. (See, *Specification*, p. 10, lines 9-21) Upon reading the interleaved data, the reference fields are analyzed and compared against expected readout conditions. (See, *Specification*, p. 11, lines 4-7, Figs. 3-4) As mentioned, the reference fields include predefined patterns, thus an expected readout signal can be anticipated. Based upon this analysis, readout errors can potentially be identified and adjustments to operating parameters can be made. *Id.*

Further details of the independent claims describe different aspects of the method utilizing the above discussed reference fields. Specifically, claim 1 further outlines how the reference fields are analyzed to determine if they meet a predetermined shape condition and

predetermined amplitude condition. (See, *Specification*, p. 11, lines 4-7) Further, claim 1 outlines how the system determines whether readout errors have occurred, based upon the above-referenced analysis. This process of waveform analysis, and error detection, provides the present method with the ability to identify unique errors that may be caused by several sources. The potential errors which can be identified utilizing this process are very wide reaching since the reference fields have been written along with the data. Consequently, any anomalies and misadjustments can be clearly identified. (See, *Specification*, p. 4, lines 1-3, 19-21; p. 5, lines 20-21)

Referring to claim 13, the method described therein involves the analysis of defined patterns and their reference bytes, and adjusting operating parameters as necessary based upon this analysis. (See, *Specification*, p. 6, lines 1-13) Additionally, the method likewise performs error analysis, as discussed above in relation to claim 1. See, *Infra*

The third independent claim, claim 22, adds the step of creating a reference field status bite indicative of possible errors that exist in the data. This status byte is derived from analysis of the reference fields, as compared to predefined patterns. (See, *Specification*, p. 6, lines 1-13)

As further outlined in various dependent claims, the operating parameters which can easily be adjusted include gain control and phase synchronization. More specifically, claims 3-8, 17-21, and 23-25 all specify how the reference fields are used to continually adjust operating parameters. More specifically, claims 4, 8, 18, and 24 all relate to the periodic adjustment of a read signal offset. (See, *Specification*, p. 14, lines 22 - p. 15, line 4) Again, this includes the periodic adjustment to read offset after initial adjustments have been made. *Id.*

Another parameter that is updated is read signal gain, as outlined in claims 5, 7, 17, 23, and 31. More specifically, the reference fields are examined to determine whether the readout gain is appropriately adjusted to perform readout operations. (See e.g., *Specification*, p. 13, lines 24 – p. 14, line 4)

Furthermore, periodic synchronization updates are made utilizing the reference fields. Specifically, claims 6, 20, and 25 all deal with phase synchronization utilizing the reference fields. (See, *Specification*, p. 16, lines 28 – p. 18, line 10) Lastly, frequency synchronization is also outlined in claim 21. Additionally, error correction is implemented utilizing the same reference field.

As previously mentioned, each independent claim requires that the reference field includes a defined data pattern which is periodically interleaved with data in the data field. The signal retrieved from the reference byte can be analyzed for both amplitude and shape. Based on this analysis, a reference status byte can easily be created which quickly and simply indicates whether the read-out system is accurately reading the data. This reference byte is further detailed in claims 2, 9, 11, 12, 14, 15, 22, 26, 27, 28, 29, and 30. (See, *Specification*, p. 6, lines 6-13; See also, p. 11, lines 4-7) In one embodiment, the reference status byte includes a single bit to indicate the shape status (e.g., expected shape v. unexpected shape), a single bit to indicate the amplitude status (e.g., expected amplitude v. unexpected amplitude), and the remaining bits to indicate amplitude value. (See, *Specification*, p. 6, lines 8-11) Consequently, meaningful information will be produced throughout its read process, indicating the operational status of the read-out system.

In addition, this reference status byte can then be used in conjunction with other ECC methodologies to further enhance the accuracy of data read from the storage system. (See, *Specification*, p. 7, lines 4-14; p. 11, lines 4-7) This is further set forth in claims 10, 11, and 12. For example, data correction systems which organize data in a matrix format and perform more involved data correction operations can utilize the data format described above, however, they must simply account for the presence of periodic reference bytes.

(3) ARGUMENT

In the claimed invention the interleaving of data, and the simultaneous writing or storage of this interleaved data set is a basic feature which creates several advantages. As previously indicated, the use of an interleaved data set provides the ability to easily detect errors and misadjustments within the data storage system, and make appropriate adjustments "on the fly". (See e.g., *Specification*, p. 3, line 24 – p. 4, line 3) These capabilities are made possible because the interleaved data set is stored as an interleaved data set, whereby the reference fields and the adjacent data will both be subject to any undesired operational abnormalities. This feature in conjunction with the other elements of the claimed invention, are not taught or suggested by the prior art. As such, the pending rejections should be withdrawn and the claims issued.

A. Reference Field are Not Simply Synchronization Fields

As an initial point, the Examiner contends that Appellant has contradicted the specification by contending that reference bytes or reference fields are in addition to existing synchronization or timing bytes that are typically included at the beginning of a data sector. Appellant disagrees and asserts that such a difference is clear from reading the specification. There are several instances where synchronization or resynchronization bytes are discussed and illustrated in the Appellant's specification. See e.g., *Specification*, p. 3, lines 24-27; p. 4, lines 17-19; p. 5, lines 19-20, p. 10, lines 12-14, p. 11, 24-27, page 12, lines 13-15. As would be understood and anticipated by those skilled in the art, these synchronization bytes are used for initial synchronization and initialization purposes. *Id.* Throughout the description, however, these synchronization bytes are very carefully distinguished from the reference bytes or fields illustrated and shown. See, *Specification*, p. 3, line 27 - p. 4, line 3; p.4, lines 19-21; p. 5, lines 20-22; p.6, lines 1-3; p. 10, lines 12-44. Again, the reference fields are simply small patterns

integrated into the data stream to allow for periodic updates. See, *Specification*, p. 3, line 27 – p. 4, lines 3; p.6, lines 1-13; p.8, lines 1-8; p. 11, lines 15-16. (See also, Figs. 2-5 - - Reference fields labeled as element 18 and synchronization fields labeled as 14.). In addition, there is substantial discussion related to the "update" nature of the reference bytes. See e.g., *Specification*, p. 15, lines 2-3. These reference bytes are not intended to perform the same functions as a synchronization field, but rather, provide a quick update or check of the synchronization or operation of various systems within the storage device. *Id.* This feature or characteristic of the reference bytes utilized by the present invention distinguish the claimed invention from the prior art.

B. Claim Rejections

All claims have been rejected based upon *Kuroda et al.,* in some manner. As an initial point, *Kuroda et al.,* describes a very different system than the present invention. Most importantly, *Kuroda et al.* describes a system that is concerned with rotation control of storage media, and not data storage. (See, *Kuroda et al.,* col. 1, lines 8-10) Consequently, all mechanism and methods described therein are directed to this ultimate end goal. The signals produced and systems implemented relate to speed and rotation control. (See e.g., *Kuroda et al.,* Abstract, Figs. 4, 11) Notably lacking, however, is any discussion related to readout of the data fields, the detection of readout errors and/or, the adjustment of various operating parameters, such as readout gain, etc., based upon this "data" readout.

As discussed in Appellant's initial brief, *Kuroda et al.* is focused on rotation control using pre-pits that are created on the storage media. The "tangential push-pull" detection methodology described in *Kuroda et al.* is specifically suited for the detection of these pre-pits.

(See, *Kuroda et al.*, col. 7, lines 40-42; col. 8, lines 33-49) That said, it is not related to data readouts, which is typically detected using other methods.

Throughout the Examiner's answer, continuous reference is made to portions of *Kuroda et al.* which discuss how pre-pits are formed in the recording media prior to the recording pre-information on the recording media "in accordance with pre-information to be recorded". See *Examiner's Answer*, page 16, 18. (Citing *Kuroda et al.*, col. 1, lines 66-67 and col. 2, lines 1 and 2). Appellant submits that (a) this is confusing at the very least, and (b) this further fails to teach or suggest the present invention as any alleged interleaved data set (including reference marks) is not created and subsequently stored as a complete data set. *Kuroda et al.* is confusing in its discussion of pre-pits and its use of the terms "pre-information," "data pre-information," and "sync pre-information." See *Kuroda et al.*, col. 5, line 5 ("pre-information" is recorded by forming pre-pits"); col. 5, line 25 ("pre-information is previously acquired by detecting the pre-pits 4."); col. 5, line 43 ("the pre-information is detected from the pre-pit prior to recording of the recording information ..."); col. 8, line 33 (describing detection of pre-information), col. 9, lines 6-9 (discussing the use of "pre-pit information" to create reproduction signal SPP) and lines 29-32 ("pre-information (including the sync pre-signal and data pre-information) included in reproduction signal SPP ...")[1]. It is still submitted that pre-information is all based on pre-pits. That said, it is clear that pre-information is recorded prior to writing data. See *Kuroda et al.*, col. 6, line 41. Thus, the advantages of the present invention are not possible using the methods of

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[1] In addition, the Examiner has asserted that pre-pits become distinguishable according to Fig. 2 when sync pre-information and data pre-information is recorded. *Examiner's Answer*, p. 18, last paragraph. To support this, the Examiner asserts that "The pre-information in Fig. 2 is 14T units long and is recorded information, not pits burnt into the recording media during manufacturing." *Id.*, p. 18-19. It should be noted that each mark in *Kuroda et al.* is simply 2T in length, which is the corresponding length of each pre-pit.

Kuroda et al. because the reference bits cannot be utilized to detect ongoing errors, etc., in the same manner

In addition to comments provided in Appellant's original brief, it is clear that *Kuroda et al.* lacks incorporation of data with the "reference fields" (pre-information) discussed. While Appellant and the Examiner may disagree on the source of "pre-information" there is a lack of any discussion related to the blending of signals with the data. The reference information (pre-information) described by *Kuroda et al.* and classified as a sync pre-signal and data pre-information. See, *Kuroda et al.*, col. 5, lines 66 - col. 6, line 1. In each case, the sync pre-information and data pre-information are both recorded into specific synchronization fields prior to the introduction of data information (See, *Kuroda et al.,* col. 6, lines 12-15 and, lines 41-44). This discussion clearly involves the creation of synchronization marks and signals on the disk, as opposed to the process described in the claimed invention as interleaving data and subsequently storing this interleaved data.

Another aspect of the present invention involves analyzing the predetermined shape and predetermined amplitude conditions. The Examiner has asserted that phase and amplitude determination of a digital pulse as described by *Kuroda et al.,* anticipates the claimed invention. See e.g., *Examiner's Answer*, p. 5, lines 6-7. Appellant disagrees. The detection of a digital pulse is very different than the signal analysis carried out by the present invention (including amplitude detection and <u>shape</u> detection). More specifically, the present invention involves shape detection, which very closely analyzes the waveform developed by the readout. See, *Specification*, p.6, lines 1-13; p; 11, lines 4-7; Fig. 3 (illustrating samples at many points along the waveform). Variations or deviations in this waveform, as compared to an expected signal, suggest problems exist and cause the present invention to identify or flag these potential

problems. Where appropriate, these problems can quickly and efficiently be adjusted. See e.g., *Specification*, p. 3, line 27 – p. 4, line 3; p. 11, lines 4-7. This involves signal analysis which is very different from the pulse detection of *Kuroda et al.*

With respect to claim1 specifically, the interleaved data set is required to be stored within the data storage area. When examined more closely, this inherently requires these reference fields not be placed within synchronization or initialization areas. Referring now to *Kuroda et al.*, the process described specifically teaches away from this by having synchronization and pre-information fields at the head of each recording sector (i.e., a specific synchronization frame), as opposed to written within the data storage area. *Kuroda et al.* specifies that no data is written to this area. *Kuroda et al.*, col. 6, lines 44-51 By providing a storage methodology whereby reference fields are stored within a data storage area, all of the advantages outlined in the specifications are made possible.

Lastly, the Examiner states "**A sync frame is a data frame.**" (See, *Examiner's Answer*, p. 17, line 3 (emphasis in original)). While any label can be used to identify a particular structure, it is important to look at the characteristics involved. Most significantly, the sync frame of *Kuroda et al.* has sync pre-signals recorded prior to the recording of data. (See, *Kuroda et al.*, col. 6, lines 12-15, and 41-44) Consequently, a sync frame is not the same as the data frames provided in the present invention with reference fields interleaved therein. As shown in Fig. 2 of the specification, the reference fields are different from synchronization fields. As such, Kuroda et al. cannot be interpreted as anticipating this claimed invention.

CONCLUSION

For the reasons outlined above, Appellant submits that the pending grounds for rejection are inappropriate. As such, the claims should be allowed and the application be passed to issuance.

If any fees are due in connection with the filing of this paper, then the Commissioner is authorized to charge such fees including fees for any extension of time, to Deposit Account No. 50-1901 (Docket 18504-333).

Respectfully submitted,

By ______________________

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Attachment: Appendix (Claims Subject to Appeal)

Claims Subject to Appeal

1. (Previously presented) A method of storing data on a storage medium having data storage areas and retrieving the stored data which includes the ability to predict readout errors when the stored data is retrieved, comprising:

interleaving the data with a plurality of reference fields, each reference field including a defined data pattern;

storing the interleaved data within the data storage areas such that the reference fields are at predetermined locations;

upon demand, retrieving the interleaved data;

analyzing the retrieved interleaved data by testing the retrieved reference field to determine if the retrieved reference field meets a predetermined shape condition and a predetermined amplitude condition; and

determining whether readout errors have been encountered based upon the results of the interleaved data analysis.

2. (Original) The method of claim 1 further comprising the production of a reference status byte in response to the analysis step, the reference status byte including an amplitude bit and a shape bit to indicate compliance with the predetermined amplitude condition and the predetermined shape condition, respectively for the analyzed reference field.

3. (Original) The method of claim 1 further comprising the analysis of the reference bytes to perform operating parameter updates for the data storage system.

4. (Original) The method of claim 3 wherein the operating parameter updates include adjustments to a readout system in the data storage system so that a read signal offset is optimized.

5. (Original) The method of claim 3 wherein the operating parameter updates include adjustments to a readout system in the data storage system so that a read signal gain is optimized.

6. (Original) The method of claim 3 wherein the operating parameter updates include adjustments to a synchronization system within the data storage system so that optimum phase synchronization can be achieved between a readout signal and a storage media synchronization signal.

7. (Original) The method of claim 5 wherein the read signal gain is optimized by adjusting the readout system to maximize the resolution of the readout window so that the reading of the defined data in the reference field will fill substantially all of the readout window.

8. (Original) The method of claim 4 wherein the read signal offset is optimized by adjusting the readout system to maximize the resolution of the readout window so that the reading of the defined data in the reference field will fill substantially all of the readout window.

9. (Original) The method of claim 2 further comprising predicting the existence in data retrieval errors in the read data on either side of the reference field based upon the reference status byte.

10. (Previously presented) The method of claim 1 wherein the data is stored on the storage media is analyzed as a virtual matrix to allow for further error correction operations, and wherein the reference fields are arranged as a plurality of columns within the virtual matrix.

11. (Original) The method of claim 10 further comprising the production of a reference status byte in response to the analysis step, the reference status byte including an amplitude bit and a shape bit to indicate compliance with the predetermined amplitude condition and the predetermined shape condition, respectively for the analyzed reference field.

12. (Previously presented) The method of claim 11 further comprising predicting the existence of data retrieval errors in the read data on either side of the reference field based upon the reference status byte.

13. (Previously presented) A method of continuously controlling a plurality of operating perimeters and providing error correction capabilities for a data storage system, the method comprising:

storing an interleaved data set which includes a plurality of reference bytes interleaved with information data, each reference byte including a defined data pattern and being placed at a predetermined location within the interleaved data set;

reading the information data and the interleaved reference bytes, and

based upon the defined data pattern of the reference bytes, adjusting operating parameters as necessary and performing error correction analysis.

14. (Previously presented) The method of claim 13 wherein the step of error correction analysis includes analyzing the retrieved reference bytes to determine if the retrieved reference bytes meets a predetermined shape condition and a predetermined amplitude condition; and predicting whether readout errors exist on either side of the reference byte based upon the results of the reference byte analysis.

15. (Previously presented) The method of claim 13 further comprising the production of a reference status byte in response to an analysis of the reference byte, the reference status byte including an amplitude bit and a shape bit to indicate compliance with the predetermined amplitude condition and the predetermined shape condition, respectively.

16. (Original) The method of claim 13 further comprising initializing the data storage device by reading an initialization data pattern and adjusting the readout system to maximize the resolution of the readout window so that the reading of the initialization data pattern will fill substantially all of the readout window.

17. (Previously presented) The method of claim 13 wherein the step of adjusting operating parameters involves adjusting a gain window of a readout amplifier so that the readout of the predetermined pattern will fill substantially all of the gain window.

18. (Previously presented) The method of claim 13 wherein the operating parameter is the read signal offset.

19. (Previously presented) The method of claim 13 wherein the operating parameter is the read signal gain.

20. (Previously presented) The method of claim 13 wherein the operating parameter is the phase synchronization of the data storage device read system.

21. (Previously presented) The method of claim 13 wherein the operating parameter is the frequency synchronization of the data storage device read system.

22. (Previously presented) A method of providing optimum read channel operation in a data storage device, the method comprising:

storing data on a storage media which includes periodic reference fields that are interleaved within information data, each reference field including a defined pattern; and

using the periodic reference fields to update a plurality of operating parameters of the read channel and to provide a reference field status byte indicative of possible errors that exist in the data.

23. (Original) The method of claim 22 wherein one of the plurality of operating parameter is a read signal gain, wherein the read signal gain is adjusted to an optimum level depending on the results of reading the reference fields.

24. (Original) The method of claim 22 wherein one of the plurality of operating parameter is a read signal offset, wherein the read signal offset is adjusted to an optimum level depending on the results of reading the reference fields.

25. (Original) The method of claim 22 wherein one of the plurality of operating parameter is a read signal phase synchronization, wherein a read clock signal is adjusted to an optimum level depending on the results of reading the reference fields.

26. (Original) The method of claim 22 wherein the reference field status byte is obtained by comparing the amplitude and shape of a readout from the reference field with an expected readout signal, and the reference field status byte is indicative of whether the readout from the reference field matches the expected readout signal.

27. (Original) The method of claim 26 wherein the reference field status byte includes a first bit indicative of whether the amplitude of the readout from the reference field matches the expected readout signal.

28. (Original) The method of claim 27 wherein the reference field status byte includes a second bit indicative of whether the shape of the readout from the reference field matches the expected readout signal.

29. (Original) The method of claim 22 further comprising the performance of an error correction methodology, wherein the reference field status byte is utilized by the error correction methodology to provide efficient error correction.

30. (Original) The method of claim 28 wherein the reference field status byte includes further bits indicative of the amplitude of the readout from the reference field.

31. (Original) The method of claim 23 wherein the read signal gain is adjusted to an optimum level which allows for effective signal conditioning.